

WHAT IS CLAIMED IS:

1. A substrate cleaning method comprising:  
cleaning a to-be-cleaned substrate disposed in  
a cleaning cup by use of an acid liquid agent; and  
5        cleaning the substrate by use of an alkaline  
liquid agent in the cleaning cup to neutralize residue  
of the acid liquid agent after the step of cleaning by  
use of the acid liquid agent.
2. The substrate cleaning method according to  
10       claim 1, wherein the cleaning by use of an acid liquid  
agent includes emitting a preset amount of acid liquid  
agent to the to-be-cleaned substrate, then immediately  
interrupting the emission and rotating the to-be-  
cleaned substrate at a low speed of approximately 15 to  
15       30 rpm to uniformly spread the acid liquid agent on the  
surface of the to-be-cleaned substrate.
3. The substrate cleaning method according  
to claim 1, further comprising rinsing the to-be-  
cleaned substrate by use of pure water of approximately  
20       60°C to 80°C between the step of cleaning by use of the  
acid liquid agent and the step of cleaning by use of  
the alkaline liquid agent.
4. The substrate cleaning method according to  
claim 3, further comprising repeatedly performing  
25       the cleaning by use of the acid liquid agent and the  
rinsing by use of pure water.
5. The substrate cleaning method according to

claim 1, further comprising cleaning the cleaning cup by use of one of pure water and alkaline liquid agent between the cleaning by use of the acid liquid agent and the cleaning by use of the alkaline liquid agent.

5           6. The substrate cleaning method according to claim 1, further comprising rinsing and drying the to-be-cleaned substrate after the cleaning by use of the alkaline liquid agent.

10           7. The substrate cleaning method according to claim 6, wherein the rinsing and drying the to-be-cleaned substrate includes a step of emitting one of an alkaline liquid agent and hot pure water of approximately 60°C to 80°C onto a surface of the to-be-cleaned substrate and rotating the to-be-cleaned substrate at  
15           a high speed not lower than approximately 700 rpm after the emitting one of the alkaline liquid agent and the hot pure water.

20           8. The substrate cleaning method according to claim 7, wherein the emitting one of an alkaline liquid agent and hot pure water includes emitting one of the alkaline liquid agent and the hot pure water to a portion slightly separated from the center of the surface of the to-be-cleaned substrate.

25           9. The substrate cleaning method according to claim 7, wherein the rotating the to-be-cleaned substrate at a high speed includes rotating the to-be-cleaned substrate at a lower speed than the high speed

and rotating the to-be-cleaned substrate at the high speed not lower than approximately 700 rpm after a drying process for a pattern forming portion on the surface of the to-be-cleaned substrate is almost  
5 terminated.

10. The substrate cleaning method according to claim 6, further comprising repeatedly performing the cleaning by use of the alkaline liquid agent and the rinsing and drying the to-be-cleaned substrate.

10 11. The substrate cleaning method according to claim 1, the cleaning by use of an alkaline liquid agent includes emitting hot pure water of approximately 60°C to 80°C to a rear surface of the to-be-cleaned substrate.

15 12. A substrate cleaning method comprising:  
oxidizing impurities on a surface of a to-be-cleaned substrate by use of an oxidizing agent; and  
cleaning the to-be-cleaned substrate by use of a reducing agent to remove the oxidized impurities  
20 after the oxidizing step.

13. The substrate cleaning method according to claim 12, wherein the oxidizing impurities by use of an oxidizing agent includes emitting a heated acid liquid agent onto the to-be-cleaned substrate by an small  
25 amount, then immediately interrupting the emission and rotating the to-be-cleaned substrate at a low speed of approximately 15 to 30 rpm to uniformly spread the acid

liquid agent on the surface of the to-be-cleaned substrate.

14. The substrate cleaning method according to claim 12, further comprising rinsing the to-be-cleaned substrate by use of pure water of approximately 60°C to 80°C between the oxidizing the impurities and the removing the oxidized impurities.

15. A substrate cleaning apparatus comprising:  
a cleaning cup configured to receive a to-be-cleaned substrate;

a table disposed in the cleaning cup, configured to support the to-be-cleaned substrate;

a first nozzle disposed in the cleaning cup, configured to supply an acid liquid agent;

15 a second nozzle disposed in the cleaning cup, configured to supply an alkaline liquid agent;

a third nozzle disposed in the cleaning cup, configured to supply hot pure water;

20 a pure water heating mechanism configured to supply the hot pure water;

a branch line formed in an intermediate portion of a pipe extending from the pure water heating mechanism to the third nozzle configured to supply the hot pure water to lower water pressure in the pipe; and

25 a control mechanism configured to control operations of the first to the third nozzle and the pure water heating mechanism.

16. The substrate cleaning apparatus according to claim 15, which further comprises an open/close valve provided between the branch line and the pipe and in which the control mechanism has an operation for causing the hot pure water supply nozzle to emit hot pure water, interrupting the emission and opening the open/close valve to lower the pressure in the pipe.

17. The substrate cleaning apparatus according to claim 16, wherein the pure water heating mechanism controls the temperature of the hot pure water in a range of 60°C to 80°C.

18. The substrate cleaning apparatus according to claim 15, wherein the to-be-cleaned substrate supporting table has an opening configured to substantially expose a rear surface of the to-be-cleaned substrate and is made rotatable.

19. The substrate cleaning apparatus according to claim 18, wherein the third nozzle for supplying hot pure water is disposed below the to-be-cleaned substrate supporting table to emit hot pure water to the rear surface of the to-be-cleaned substrate.

20. The substrate cleaning apparatus according to claim 15, further comprising a fourth nozzle configured to clean the cleaning cup.

21. The substrate cleaning apparatus according to claim 15, further comprising a moving mechanism configured to change a relative position between the

cleaning cup and the to-be-cleaned substrate supporting table.